AQA
Realising potential

TOPIC TEST MARK SCHEME

AS and A-level MATHS

Coordinate geometry and circles

Mark scheme

Specification content coverage: C1, C2

Question	Solutions	Mark
1	$y-(-1)=3(x-4)$	1
2 (a)	$3y=-2x+7$ $y=-\frac{2}{3}x+\frac{7}{3}$ gradient = $-\frac{2}{3}$ y-intercept = $\frac{7}{3}$ x-intercept = $\frac{7}{2}$	 1 1 1
2 (b)	parallel so gradient = $-\frac{2}{3}$ $(y-y_1)=-\frac{2}{3}(x-x_1)$ OE: $y=-\frac{2}{3}x+c$ passes through the point (3, 5) $(y-5)=-\frac{2}{3}(x-3)$ OE: $y=-\frac{2}{3}x+7$	1 1 method 1
2 (c)	$2x+3(2x+1)-7=0$ $8x-4=0$ $x=\frac{1}{2}$ OE: $y=2$	1 1

3 (a)	gradient $PQ = \frac{4}{3}$ gradient $QR = -\frac{3}{4}$ $\frac{4}{3} \times -\frac{3}{4} = -1$ hence *PQ* and *QR* are perpendicular	1 1 1
3 (b)	$\sqrt{(5-1)^2 + (3-6)^2}$ $\sqrt{25}$ 5	1 1
4	Radius = 8 $(x-2)^2 + (y+5)^2 = 8^2$	1 1
5	$x^2 + 4x + y^2 - 6y - 8 = 0$ $(x+2)^2 - 4 + (y-3)^2 - 9 - 8 = 0$ $(x+2)^2 + (y-3)^2 = 21$ Centre (–2, 3) and radius $\sqrt{21}$	1 method 1 1
6	gradient $AB = \frac{2}{3}$ gradient $BC = -\frac{3}{2}$ Since *AB* and *BC* are perpendicular, triangle *ABC* forms a right-angled triangle. Alternative method: Find lengths *AB*, *BC* and *AC* and show that the triangle satisfies Pythagoras Theorem Using the fact that an angle in a semi-circle is a right angle it can be concluded that *AC* is a diameter.	1 1 1 1

7	Since *AB* is a chord of the circle the perpendicular bisector will be an equation of a diameter gradient *AB* = $-\frac{3}{4}$ gradient of perpendicular line = $\frac{4}{3}$ equation of perpendicular line $(y-y_1)=\frac{4}{3}(x-x_1)$ OE: $y=\frac{4}{3}x+c$ midpoint of *AB* = $\left(3,\frac{5}{2}\right)$ Therefore, equation of a diameter $\left(y-\frac{5}{2}\right)=\frac{4}{3}(x-3)$ OE: $y=\frac{4}{3}x-\frac{3}{2}$	1 1 1 1 1
8	$x^2+3x+k^2+2k-\frac{3}{4}=0$ If the line does not intersect the circle, then $b^2-4ac<0$ $3^2-4\times1\times\left(k^2+2k-\frac{3}{4}\right)<0$ $9-4k^2-8k+3<0$ $-4k^2-8k+12<0$ $4k^2+2k-3>0$ $(k-1)(k+3)>0$ $k<-3$ or $k>1$ Alternative method: Find the centre and radius of the circle and then consider which horizontal lines would intersect.	1 1 1 1

Rationale

19 marks scaffolded, with basic skill assessed
13 marks applying, including some more advanced problem-solving using skills from prior topics